REMARKS

The present Amendment amends claims 17-20. Therefore, the present application has pending claims 17-20.

Claim Objections

Claim 17 stands objected to due to informalities noted by the Examiner. Amendments were made to claim 17 to correct the informalities.

Furthermore, Applicants direct the Examiner's attention to page 3, lines 1-6 of the specification, which provides that an object of the present invention is to provide an apparatus for preparing an analytical model. The analytical model is prepared using shape models previously made. The object of the invention is accomplished by eliminating the need for a user to select a template by presenting a proper template from among a plurality of already prepared templates (i.e., shape models previously made) during the process of preparing the analytical model. In other words, the present invention is directed to the preparation of an analytical model by using a plurality of already prepared templates (shape models previously made). Accordingly, Applicants submit that contrary to the Examiner's assertions, the exact meaning of the term "preparing" and the exact difference between a prepared model (i.e., shape models previously made, or templates) and an unprepared model (i.e., the analytical model to be prepared) is clear in light of the usage of the terms in the claims and in view of the description in the specification.

Therefore, this objection is overcome and should be withdrawn.

35 U.S.C. §103 Rejections

Claims 17-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Database Techniques for Archival of Solid Models* by McWherter, et al. ("McWherter") in view of U.S. Patent Application No. 2002/0042697 to Yamada, et al. ("Yamada"). This rejection is traversed for the following reasons. Applicants submit that the features of the present invention, as now more clearly recited in claims 17-20, are not taught or suggested by McWherter or Yamada, whether taken individually or in combination with each other in the manner suggested by the Examiner. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims to more clearly describe features of the present invention. Specifically, amendments were made to the claims to more clearly recite that the present invention is directed to an analytical model preparing apparatus as recited, for example, in independent claim 17.

The present invention, as recited in claim 17, provides an analytical model preparing apparatus including a means for entering a shape model to be analyzed, a database that maps and registers each of a plurality of shape models previously made together with analytical mesh models corresponding to the shape models previously made, and a degree of approximating calculating means. The degree of approximation calculating means includes a means for preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously made, and associating the shape elements in the shape model to be analyzed with the shape

elements in the shape models previously made. The degree of approximation means also includes a means for calculating a degree of approximation of the shape elements of the shape models previously made based on the number of shape elements of the shape model to be analyzed and the number of shape elements of the shape model previously made associated with the associated information of the shape elements. The degree of approximation means further includes a means for displaying sequentially the shape models previously made from larger to smaller degrees of approximation on a display screen. Also included in the degree of approximation means is a means for selecting, in response to an instruction, at least one of the shape models previously made from among the shape models previously made displayed. The degree of approximation means also includes an analytical model preparing means for preparing an analytical mesh model of the shape model to be analyzed by use of attribute information prepared for the analytical mesh model corresponding to the shape model previously made selected by the means for selecting, in accordance with the associated information of the shape elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made. The prior art does not teach or suggest all of these features.

The above described features of the present invention, as now more clearly recited in the claims, are not taught or suggested by any of the references of record. Specifically, the features are not taught or suggested by either McWherter or Yamada, whether taken individually or in combination with each other.

McWherter teaches database techniques for the archival of solid models. However, there is no teaching or suggestion in McWherter of the analytical model preparing apparatus as recited in claim 17 of the present invention.

McWherter discloses techniques for managing solid models in modern relational database management systems. The goal of these techniques is to enable support for traditional database operations (sorting, distance metrics, range queries, nearest neighbors, etc.) on large databases of solid models. McWherter's techniques involve constructing a mapping from the boundary representation of a solid model to a graph-based data structure called a Model Signature Graph. The graphs are then projected into vector spaces, and distances between models based on the distances of their images in these spaces are examined. These distances become central elements in indexing and clustering of the solid models.

One feature of the present invention, as recited in claim 17, includes a degree of approximation calculating means, which includes a means for preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously made, and associating the shape elements in the shape model to be analyzed with the shape elements in the shape models previously made. McWherter does not disclose this feature. For example, with reference to Fig. 1 and the text that accompanies Fig. 1, McWherter discloses a technique for the transformation from a solid model to a model signature to be used for database clustering. As shown and described, a mapping from the boundary representation of a solid model is constructed. This mapping is a graph-based data structure referred to as the Model

Signature Graph. Two alternative projections from the Model Signature Graph to vector spaces are developed, based on the semantic and structural properties in the graph. The object of this technique is to store a collection of CAD/CAM models in a database and to perform efficient search and retrieval of these models. In addition, the object is to cluster the collection of these models in order to extract information regarding the structure and distribution of the models in the database. These features of McWherter, of transforming from a solid model to a model signature to be used for database clustering and indexing, are quite different from preparing associated information, in the manner claimed. More specifically, McWherter's technique is not the same as preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously made, and associating the shape elements in the shape model to be analyzed with the shape elements in the shape models previously made. McWherter, which is merely directed to archiving solid models in a relational database management system, does not teach or suggest preparing associated information of shape elements, by comparing shape elements of an input shape model (i.e., the shape model to be analyzed input by way of the means for entering a shape model to be analyzed) with shape elements of shape models in a template (i.e., shape models previously made), as claimed.

In response to Applicants arguments regarding this feature, the Examiner notes that the claims do not recite the terms "input shape model" and "shape models in a template". Although the Examiner is correct in this assertion, the claims do recite comparing shape elements in "the shape model to be analyzed" (an input

shape model), with shape elements in "the shape models previously made" (shape models in a template). As previously discussed, McWherter does not teach or suggest comparing shape elements, and in the response to Applicants' arguments, the Examiner has not indicated why the Examiner persists in the asserting that McWherter teaches comparing shape elements, in the manner claimed. Accordingly, Applicants respectfully request that the Examiner either specifically point out where McWherter teaches comparing shape elements, as claimed, or to withdraw the rejection.

Another feature of the present invention, as recited in claim 17, includes where the degree of approximation calculating means includes a means for calculating a degree of approximation of the shape elements of the shape models previously made, based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements. McWherter does not disclose this feature. As previously discussed, McWherter does not teach preparing associated information of shape elements, in the manner claimed. Therefore, it follows that McWherter does not teach a means for calculating a degree of approximation based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements. Furthermore, as described in Section 3.2 (pages 81-82), McWherter merely discloses techniques of spectral graph theory as a basis for approximating graph similarity among model signature graphs. These techniques are used to approximate graph similarity among a set of template graphs. This is not the same as a means for calculating a degree of approximation of shape elements of the

shape models previously made based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements, in the manner claimed.

In response to Applicants' arguments regarding this feature, the Examiner asserts that Applicants' argument provide no insight into how the claimed invention operates or has inherent functionality that distinguishes from the reference applied. Applicants respectfully disagree. As previously discussed, Section 3.2 (pages 81-82) of McWherter merely discloses techniques of spectral graph theory as a basis for approximating graph similarity among model signature graphs. These techniques are used to approximate graph similarity among a set of template graphs. This is not the same as a means for calculating a degree of approximation of shape elements of the shape models previously made (i.e, template shape models) based on the number of shape elements of the shape model to be analyzed (i.e., input shape model) associated with the associated information of the shape elements, in the manner claimed. In other words, approximating graph similarity among a set of template graphs is quite different from calculating a degree of approximation of shape models previously made based on the number of shape elements of the shape model to be analyzed. Accordingly, if the Examiner persists in this rejection, Applicants respectfully request the Examiner to provide specific reasons why this argument is not persuasive, or to withdraw the rejection.

Yet another feature of the present invention, as recited in claim 17, includes a means for displaying sequentially the shape models previously made from larger to smaller degrees of approximation on a display screen. McWherter does not disclose

this feature. To support the assertion that McWherter teaches this feature, the Examiner cites Fig. 2 on page 81. However, as described on page 81, Fig. 2 illustrates a transformation from the boundary representation of a solid model for a motor crankcase into a Model Signature Graph. A Model Signature Graph is a specialized graph structure used to represent solid models with the intention of performing similarity comparisons (see Section 3.1 on page 81). The structure shown in Fig. 2 is constructed from the boundary representation of the solid model for the motor crankcase. This display of a motor crankcase and the Model Signature Graph for the motor crankcase is not the same as displaying sequentially the shape models previously made from a larger to smaller degrees of approximation on a display screen as in the present invention. In the present invention, the means for displaying, as claimed, has advantageous features. For example, by sequentially displaying the shape models previously made on the screen from larger to smaller degrees of approximation, it is easy to select with certainty an appropriate previously made shape model as a template for preparing an analytical mesh mode of the shape model to be analyzed. By way of further example, good quality of the analytical mesh model of the shape model to be analyzed in prepared in a short time. Accordingly, McWherter does not teach this claimed feature.

Still yet another feature of the present invention, as recited in claim 17, includes an analytical model preparing means. The analytical model preparing means prepares an analytical mesh model of the shape model to be analyzed, by use of attribute information prepared for the analytical mesh model corresponding to the at least one already prepared shape model selected by the means for selecting,

in accordance with the associated information of the shape elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made. McWherter does not disclose this feature, and the Examiner does not rely upon McWherter for teaching this feature.

Therefore, McWherter fails to teach or suggest "means for preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously made and associating the shape elements in the shape model to be analyzed with the shape elements in the shape models previously made" as recited in claim 17.

Furthermore, McWherter fails to teach or suggest "means for calculating a degree of approximation of the shape elements of the shape models previously made based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements," as recited in claim 17.

Even further, McWherter fails to teach or suggest "means for displaying sequentially the shape models previously made from larger to smaller degrees of approximation on a display screen" as recited in claim 17.

Yet even further, McWherter fails to teach or suggest "an analytical model preparing means for preparing an analytical mesh model of the shape model to be analyzed by use of attribute information prepared for the analytical mesh model corresponding to said at least one already prepared shape model selected by the means for selecting, in accordance with the associated information of the shape

<u>elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made</u>" as recited in claim 17.

The above noted deficiencies of McWherter are not supplied by any of the other references of record, namely Yamada, whether taken individually, or in combination with each other. Therefore, combining the teachings of McWherter and Yamada in the manner suggested by the Examiner still fails to teach or suggest the features of the present invention as now more clearly recited in the claims.

Yamada teaches a method, apparatus and system for generating and analyzing a mesh for a shape model. However, there is no teaching or suggestion in Yamada of the analytical model preparing apparatus as recited in claim 17 of the present invention.

Yamada discloses the formation of a conventional mesh as sample in order to generate a high-quality mesh for a predetermined shape model. The mesh generation system of Yamada includes a mesh characteristic extraction unit for receiving a conventional mesh, and for extracting a characteristic from. The system further includes a mesh generator for receiving a target shape model for mesh generation, and for generating a mesh for the shape model, based on the characteristic of the conventional mesh extracted by the mesh characteristic extraction unit.

One feature of the present invention, as recited in claim 17, includes a degree of approximation calculating means, which includes a means for preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously

made, and associating the shape elements in the shape model to be analyzed with the shape elements in the shape models previously made. Yamada does not disclose this feature, and the Examiner does not rely upon Yamada for teaching a degree of approximation calculation means, as claimed.

Another feature of the present invention, as recited in claim 17, includes where the degree of approximation calculating means includes a means for calculating a degree of approximation of the shape elements of the shape models previously made, based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements. Yamada does not disclose this feature, and the Examiner does not rely upon Yamada for teaching a degree of approximation calculating means, as claimed.

Yet another feature of the present invention, as recited in claim 17, includes a means for displaying sequentially the shape models previously made from larger to smaller degrees of approximation on a display screen. Yamada does not disclose this feature, and the Examiner does not rely upon Yamada for teaching this feature.

Still yet another feature of the present invention, as recited in claim 17, includes an analytical model preparing means. The analytical model preparing means prepares an analytical mesh model of the shape model to be analyzed, by use of attribute information prepared for the analytical mesh model corresponding to the at least on already prepared shape model selected by the means for selecting, in accordance with the associated information of the shape elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made. Yamada does not disclose this feature. For

example, in paragraphs [0078] to [0081], Yamada discloses the processing performed by a mesh generation system. However, there is no teaching or suggestion in Yamada of an analytical model preparing means for preparing an analytical mesh model, in accordance with the associated information of the shape elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made, in the manner claimed.

Therefore, Yamada fails to teach or suggest "means for preparing associated information of shape elements by comparing shape elements in the shape model to be analyzed with shape elements in the shape models previously made and associating the shape elements in the shape model to be analyzed with the shape elements in the shape models previously made" as recited in claim 17.

Furthermore, Yamada fails to teach or suggest "means for calculating a degree of approximation of the shape elements of the shape models previously made based on the number of shape elements of the shape model to be analyzed associated with the associated information of the shape elements," as recited in claim 17.

Even further, Yamada fails to teach or suggest "means for displaying sequentially the shape models previously made from larger to smaller degrees of approximation on a display screen" as recited in claim 17.

Yet even further, Yamada fails to teach or suggest "an analytical model preparing means for preparing an analytical mesh model of the shape model to be analyzed by use of attribute information prepared for the analytical mesh model corresponding to said at least one already prepared shape model selected by the

<u>means for selecting, in accordance with the associated information of the shape elements between the shape elements in the shape model to be analyzed and the shape elements in the shape models previously made</u>" as recited in claim 17.

Both McWherter and Yamada suffer from the same deficiencies, relative to the features of the present invention, as recited in the claims. Therefore, combining the teachings of McWherter and Yamada in the manner suggested by the Examiner does not render obvious the features of the present invention as now more clearly recited in the claims. Accordingly, reconsideration and withdrawal of the 35 U.S.C. §103(a) rejection of claims 17-20 as being unpatentable over McWherter in view of Yamada are respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references used in the rejection of claims 17-20.

In view of the foregoing amendments and remarks, Applicants submit that claims 17-20 are in condition for allowance. Accordingly, early allowance of claims 17-20 is respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of Mattingly, Stanger, Malur & Brundidge, P.C., Deposit Account No. 50-1417 (referencing attorney docket no. 389.41181X00).

Respectfully submitted,

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